Volume 67 Article 3

1-1-1980

Timber Supply

Marion Clawson
Iowa State University

Timber Supply

The domestic demand for industrial wood will continue to increase. Also competing demands on forests for other purposes will increase. However, the U.S. has a substantial capacity to grow more timber than we are now growing. This challenge will continue to make forestry an exciting profession.

by Marion Clawson

"Supply" is a word widely used, hence one with several meanings. A meaningful and unambiguous exchange of ideas between us on the subject of timber supply requires some initial difinitions of terms and concepts. At the minimum, we must distinguish between shortrun timber supply, or the ability to harvest timber from a presently available stock, and longrun supply, or the ability and willingness to grow timber for future harvests. I have preferred to call these "willingness to harvest" and "willingness to invest in growing" timber, to measure human reaction rather than biological potential. Some trees will grow without Man's help and indeed some will grow in spite of almost anything we may do to try to prevent them. But investment of capital, labor, and management capabilities will increase timber growth for potential future timber harvest. At any given moment, our timber supply is limited to that volume and those kinds of trees which have grown in the past and are now standing.

For each of these concepts of timber supply, there is (a) a physical or biological or ecological dimension, such as identification of timber species, measurement of timber volumes, descriptions of tree sizes, and measures of timber quality; (b) a technological factor, or the ability to use particular species, sizes, and qualities for end products which we want; and (c) an economic factor, or a demand for particular kinds of wood which give the physical volumes some value. The latter clearly depends on the kind of uses we seek to make of the timber—some will be usable, some will not be for any particular use. The economic dimension also includes a locational factor, since timber in remote locations have little or no usability for a particlar purpose in a particular place.

Jamestown, 1607

When the first permanent settlement in the eastern United States was established at Jamestown in 1607, almost exactly half of the area now contained in the 48 contiguous States was in what the Forest Service today defines as "commercial forest," meaning forest land that can grow 25 or more cubic feet of industrial wood annually in a fully stocked natural stand at about the age of maximum mean annual increment of growth. The term "commercial" does not mean that timber can be grown profitably. These natural forests were vast in area; given the slow travel on foot or by canoe, which were the only possible means of travelling through the forested regions in those days, they were indeed "endless," as they were often described. They contained many species of trees, individual trees were often very large, and the volume of standing wood per acre was very high. In purely physical terms, the shortrun supply of timber was very large. In economic terms, much of this timber had no value—in fact, much of it was worth less than zero, in the sense that the land cleared of forest was more valuable than the same land with a forest stand.

These forests were generally at the maximum stand volumes which the species, the climate, and the site generally would support. There was little or not net growth of timber; growth did occur but it was largely or wholly offset by timber loss from decay, storm, insects, and fire. There was a great longrun supply possibility, yet no actual longrun "supply" because there was no net growth.

1800 to 1920

This original forest situation had changed but little by 1800. There had been local use of logs for building houses, local sawing of limber, local use of wood for fuel, and even some export of pine logs for masts in sailing ships, and some other limited use of wood. But most of the originally forested area was undisturbed as late as 1800.

The 19th century was the period of the greatest westward expansion in American history. "Westward the course of empire takes its way." By 1920 approximately half of the original "commercial" forest had been cleared; much of the cleared land had gone into farms, or towns and cities, or used for rights of way for roads and railroads. On the land remaining in forest, or where the timber had been cut but the land was in the process of going back to forest, the volume of standing timber had been reduced by about half also. The forest harvest methods and practices of this long period were brutal even by standards of the day and would be considered extremely so today. Fires were encouraged or set and forest regeneration was not desired. There was a general belief that the land would go into farming and that it would be more valuable without the trees than with them. Given this assumption about future land use, many of the actions taken were sound and sensible. The major mistake was in misjudging the farming potential of many areas; much land that could grow trees was prevented, at least for a time, from doing so. At the then low prices for timber, there was little or no economic incentive to invest in timber growing.

During these decades, the shortrun timber supply increased in economic terms while at the same time it was shrinking in physical terms. It was also increasing in technological terms, as lumbermen learned how to use increasing varieties, sizes, and qualities of logs. Because tree growth was so delayed on the lands cut for timber, the longrun supply of timber increased very slowly through these several

decades. From a net growth of essentially zero in 1800, the volume of wood growth increased to 1920 at about six billion cubic feet of industrial wood annually. During the long period 1800 to 1920, timber harvest exceeded net growth of timber every year. Standing volume of timber was being reduced. The latter years of this period, the cry of "timber famine" rose. Much of the prevailing foresters' concerns over impending timber shortages arose because of this 1800-1920 experience.

1920-1977

History, expecially forest history, rarely shows sharp breaks from one period to another; rather, there are gradual changes in trends which become apparent and importantly large only after some years. Nevertheless, 1920 marks a significant turning point in forest history, in part because vastly better data about American forests began to be accumulated at or after this date.

Since 1920, the area of land in "commercial forest" has been approximately stable, especially as measured against the extensive net clearings of the earlier decades. Some forested land continues to be cleared for farming or other purposes and some commercial forest is set aside in national parks, wilderness areas, or other designations which prevent timber harvest. But some previously farmed land has reverted to trees. The movement of land into and out of forests ahs left the area of commercial forest at about 500 million acres for the past sixty years.

The volume of standing tmber continued to decline after 1920 for perhaps another 25 years, but in the past 35 years the volume of standing timber (all species, all grades) has risen by about 50 percent. The data are not available for every eyar and there are some differences in definition from one date to another, so one must be a little tentative about just when these changes occurred or about just how large they were. At every date through this period, the shortrun supply of timber was fully adequate for the harvests taking place; because volume of timber stand rose, the shortrun supply of timber was also rising during this whole period.

The most significant change since 1920 has been the great increase in annual growth of wood, from about 6 billion cubic feet in 1920 to nearly 22 million in 1977 (the latest year for which data are available). This was the increase in longrun timber supply which we described at the beginning of this article—the willingness of timber owners/managers to grow more timber for future harvests. This greatly increased annual growth of timber was made possible only by the large scale timber harvest of the 1800-1920 period. That is, until the old growth stands which dominated the picture in 1800 had been cut, net growth of timber was necessarily low or zero. Everyone at all informed about forests knows that we cannot indefinitely cut more timber than we grow, because doing so reduces timber inventory, ultimately to zero; but fewer people seem to realize that one cannot indefinitely continue to have net growth of timber in excess of harvest, for this leads to an inventory accumulation to the maximum the species and the site will support. The harvest of timber 1900 to 1920 was a necessary prelude to the increased growth of timber 1920 to 1977, but this does not make sensible all the timber harvest practices of the earlier day. With just a little more care, and without significantly more investment, subsequent timber growth could have risen much earlier and probably faster than it did.

Throughout the long period from 1800 to date, foresters as a profession have seriously and repeatedly udnerestimated future growth potential of American forests. In 1933, in the "Copeland Report" the Forest Service made the most careful analysis of the forest situation that had ever been made to that time; it estimated the ultimate biological capacity of all American forests under intensive forest management to be the growth of 17 billion cubic feet of wood annually. By 1970 that growth had been exceeded and by 1977 it has been exceeded by nearly 30 percent. Other estimates of future timber growth have been equally too low. While the specific estimates have been made by the Forest Service, foresters as a profession have only infrequently protested the inaccuracy of these projections. Men whose forestry training and experience was dominated by the long period of forest depletion have found it difficult to visualize the future possibilities of timber growth.

Present Forest Situation in the United States

The United States today possesses a great wealth of timber, in substantial stands which vary in different parts of the country, among ownership classes, and by types of timber. A detailed account of this timber wealth is beyond the scope of a single short article, but the shortrun availability of timber—the shortrun supply, if you prefer that term—is high. The timber owners of the country vary also in their willingness to sell timber from inventory and in their willingness to invest to grow more timber for some future harvest. Again, a detailed account of the numerous and varied situations is beyond the scope of a single short article.

But it is highly significant that timber growth for all species for the United States as a whole exceeded timber harvest in 1977 by about 50 percent. the growth/removal relationship varied considerably between softwoods and hardwoods, by regions of the country, and among the different forest ownership groups. This favorable overall situation masks a great many less favorable trends by timber size and

continued on page 29

Marion Clawson received his B.S. and M.S. in Agriculture in 1926 and 1929, respectively, from the University of Nevada, his Ph.D. in economics from Harvard University, 1943. Clawson has been employed by the Agricultural Experiment Station, University of Nevada, Reno, Bureau of Agricultural Economics USDA, Bureau of Land Management, Economic Advisory Staff, Jerusalem, Israel and at the present is a consultant for Resources for the Future, a nonprofit, private research institution. Clawson has also contributed about 40 chapters to books edited by others, plus numerous professional journals.

continued from page 10

quality. At every period in history, it has been the most valuable and the most accessible timber which has been cut. The cutting of 150 year old and older Douglas fir along the Pacific Coast is not matched by the growing of trees of the same age and species. In the Northeast, the growth of lower grade hardwoods is vastly greater than their harvest. And many other specific situations could be cited.

The big, overall, general conclusion is: the United States is *not* running out of timber, or of forest land. Quite the contrary, we are building up our forests while at the same time the harvest of timber has been increasing.

The discussion to this point has all been in terms of "industrial wood"; that is, wood expressly for fuel (as contrasted with scraps from industrial wood) has not been considered. Interestingly enough, the available data on forests include absolutely nothing about wood for fuel (except as scraps of industrial wood are burned). The foresters have in the past generally ignored fuelwoods in their surveys and inventories, and the available statistics on growth, stand, and harvest do not include species used only for fuel.

Future Possibilities

The domestic demand for industrial wood (as lumber, plywood, and pulp) will continue to rise. There is real possibility that our exports of such wood will also rise, which would help us pay for the oil and other products we import. The demand for wood for fuel will likely continue to rise. Wood may come to be used increasingly as feedstock for chemical processes. Some foresters view these probably increases in demand with alarm. How in the world can we meet such increased demands? My reaction is very different: I view these probable future trends with approval and expectation of favorable developments. They will almost surely mean higher prices for timber and stumpage, and this will draw forth substantially increased supply over the longrun. My studies have convinced me that forest owners as a whole are responsive in the longrun to increased timber prices. One can hardly expect timber growth next year to respond much to timber prices this year, but timber growth 10 or 20 or more years in the future will be greatly influenced by timber prices this year.

The United States has a substantial capacity to grow more timber than we are now growing, even by the practiced. The growth trend of the past 60 years can be continued—more, I believe it will be continued, up to some considerably higher level than we have yet attained. The demands on forests for other purposes, such as recreation, wilderness, wildlife, watersheds, etc. will continue to increase too, but my optimism about future growth takes into account these competing demands for forests.

I have said repeatedly during the past five years that I think forestry should be an exciting and rewarding profession during the next generation. There is so much to be learned, so much to be done, such great opportunities for public service and for a rewarding personal career. ■

Forest Design

continued from page 11

are more desirable than volume increases. Individual trees which optimize productivity in a given space are preferred over excellent competitors.

There are some major disadvantages in this model. High dependence on energy, fertilizer, and pesticides are particularly important. Over the long-term, however, nutrient cycling and productivity relationships may be more critical. Consequently, more sophisticated designs may be required.

Mixed-species models generally have not been favored in commercial forestry because of the complexity of silviculture, harvesting, processing and marketing. Mixed species, however, often can produce more biomass per acre because of better use of total light and nutrients. Nitrogen-fixing hardwoods, like alder, are of greater interest in a world where energy costs are significant. Such hardwoods will become more interesting as nutrient cycling and long-term productivity relationships are better understood.

Biological control systems will become more sophisticated and successful. Also, as population dynamics are better understood, the risks and ineffective uses of pesticides will be more obvious.

Similarly, the role and importance of herbicides will change. Dropping broad spectrum herbicides from aircraft is a crude tool. Whether or not current scientific controversies are resolved, the future of herbicides will depend on more species-specific chemicals, probably applied by better trained people. The consequent increase in costs will shift attention to site preparation, superior planting stock and advanced regeneration to cope with vegetative competition.

Animal damage has taken on new dimensions since most poisons were banned for smaller pests and large game management becomes more politicized. While repellents have several advantages, deeper understanding of animal ecology and subsequent manipulation of habitats offers better protection for young forests.

Future forest design need not create all the problems of modern agriculture. It can, in fact, point the way toward more rational means of managing renewable resources.

Comments

Future forest design is strategic in nature. It represents an effort to change and shape the future rather than accept whatever happens. Consequently, such design work should be integrated into strategic planning by corporations and public agencies.

The strategic implications of designing forests are not yet obvious. First, what are biological limits and what are the potential shifts in these limits? Second, what are the tradeoffs between predicatability and uniformity in forest resources on the one hand and flexibility to meet future market and other social changes? Third, what are the relationships between short-term investment returns and long-term returns from forest investments?

These and many other practical and conceptual questions will make design of future forests a professional challenge for decades to come. ■